Space Weather Technical Forecast

Issued on Tuesday, 18 October 2022 at 13:08 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Fluence likely increasing, perhaps reaching Active (1e8 integrated pfu) by the end of the period.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with a long period C3 flare peaking at 17/1713 UTC from AR3124 in the southwest quadrant. This is the largest and most complex group, although it remains a relatively small and magnetically straightforward region. There are currently four numbered regions on the visible disc, most of which appear to be relatively small and simple bipolar regions, with little change.

There remains numerous filaments on the facing side of the Sun at present, although none obviously lifted off during this period. No Earth directed Coronal Mass Ejections (CMEs) were in evidence on available satellite imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1, showed an ongoing but waning connection to the fast wind of CH32. The wind speed declined very slightly from around 590 km/s to near 540 km/s at present. The density was mostly average. The IMF, Bt, was weak at 6nT or below, with the north-south component, Bz, varying weakly between +6/-4 nT. The phi angle was mostly negative (towards the Sun) throughout. Geomagnetic activity was mostly Quiet (Kp 0-2), with an unsettled interval (Kp 3) observed at 17/1500-1800 UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES16 has remained at background levels. High energy electron flux (greater than 2MeV) at GOES16 was at mainly moderate levels, with a peak flux of 889 pfu recorded at 17/1745UTC. The associated fluence was below the Active (1e8 integrated pfu) threshold on a slight rising trend, with 3.06e7 integrated pfu observed at 18/0001 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low, barring any significant sunspot development on the visible disc.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the current forecast, however a minor glancing blow is possible on Day 1 (18 Oct), although no significant impacts are anticipated. Earth is currently in a waning fast wind from CH32/-, with wind speeds declining near to background levels by Day 3 (20 Oct). A second coronal hole, CH33/+, may give slightly elevated wind speeds either later on Day 3 (20 Oct), or more likely on Day 4 (21 Oct).
Geomagnetic activity is expected to be Quiet to Unsettled, perhaps with Active intervals on Day 1 (18 Oct) if we see any CME influence, and again on Days 3 or 4 (20-21 Oct) as the HSS from CH33 arrives.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10MeV) is

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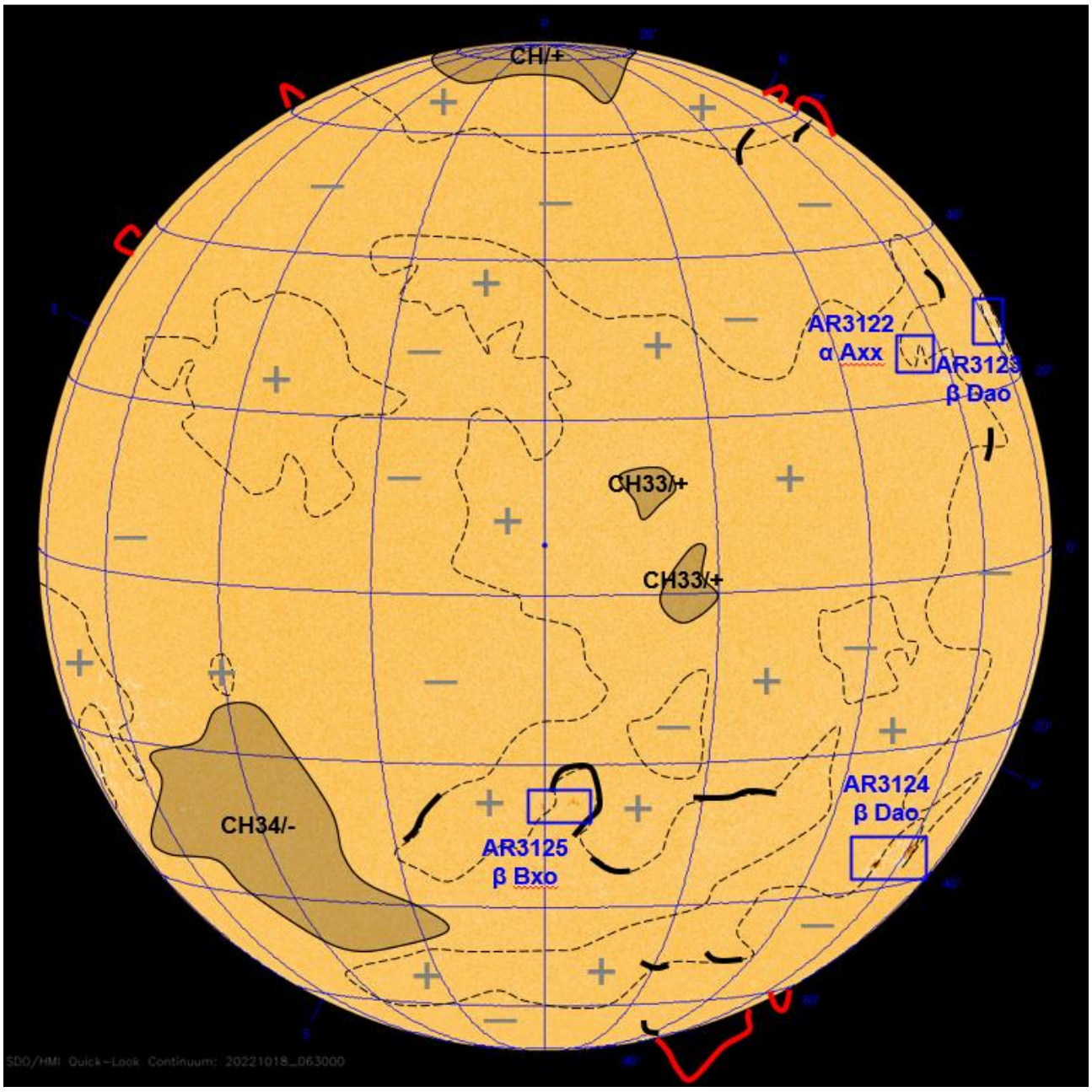
expected to be at background levels.

High energy electron flux (greater than 2MeV) as observed by GOES16 is likely to increase in the coming days. Fluence levels are expected to rise through this period, perhaps close to the Active (1e8 integrated pfu) threshold, although confidence in the magnitude of the peak fluence level is low.

Figure 1. Solar Analysis Valid 18/0630 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs in the current forecast, however a minor glancing blow is possible from a filament CME which erupted on 14/2200UTC. If this does arrive, it is likely to be on Day 1 (18 Oct), although no significant impacts are anticipated.

Earth is currently in the fast wind from CH32/- which is now starting to wane and wind speeds are likely to decline to slightly elevated levels into Day 2 (19 Oct), perhaps background levels by Day 3 (20 Oct). A second coronal hole, CH33/+, is currently just west of centre disc. It is much smaller and more fragmented than the previous rotation where it gave wind speeds up to around 500 km/s. Given that this feature has been closing up as it transits the visible disc, wind speeds may reach slightly elevated levels but are unlikely to go much higher. It is expected to arrive either later on Day 3 (20 Oct), or more likely on Day 4 (21 Oct).

Geomagnetic activity is expected to be Quiet to Unsettled, perhaps with Active intervals on Day 1 (18 Oct) if we see any CME influence, and again on Days 3 or 4 (20-21 Oct) as the HSS from CH33 arrives.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

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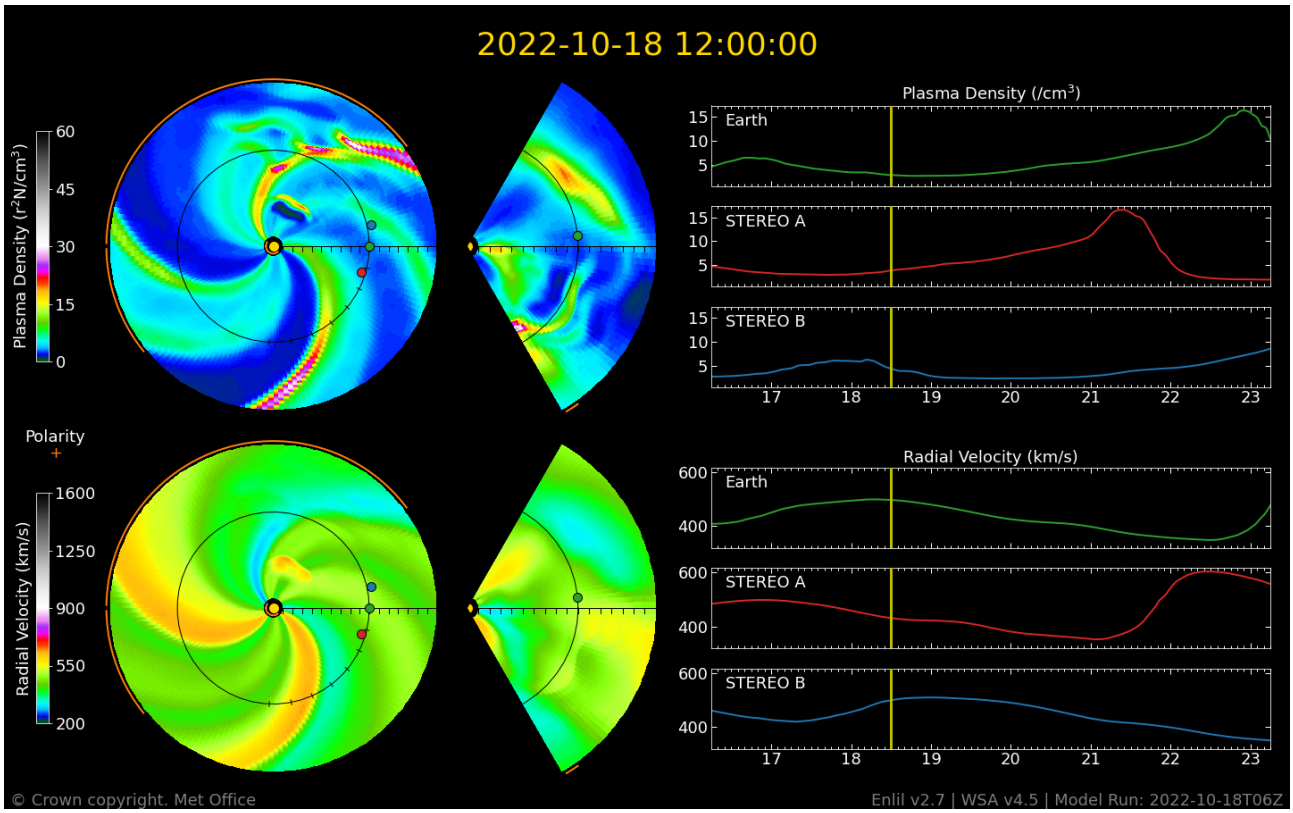
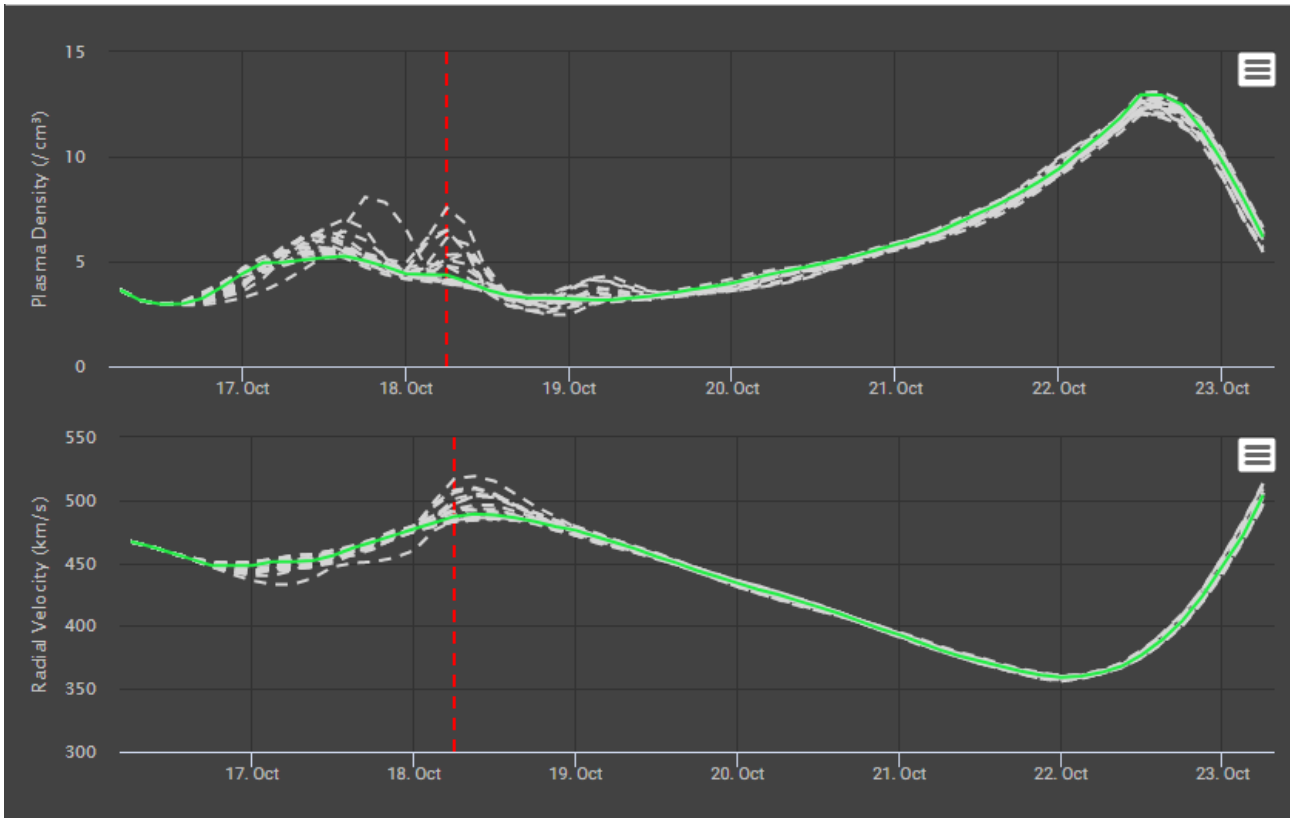
Figure 2: MOSWOC Enlil and ensemble. Enlil is currently slightly under estimating wind speeds, but the downward trend is considered reasonable. The ensemble shows a possible glancing blow early on Day 1 (18th Oct), but this risk is now considered to have passed.





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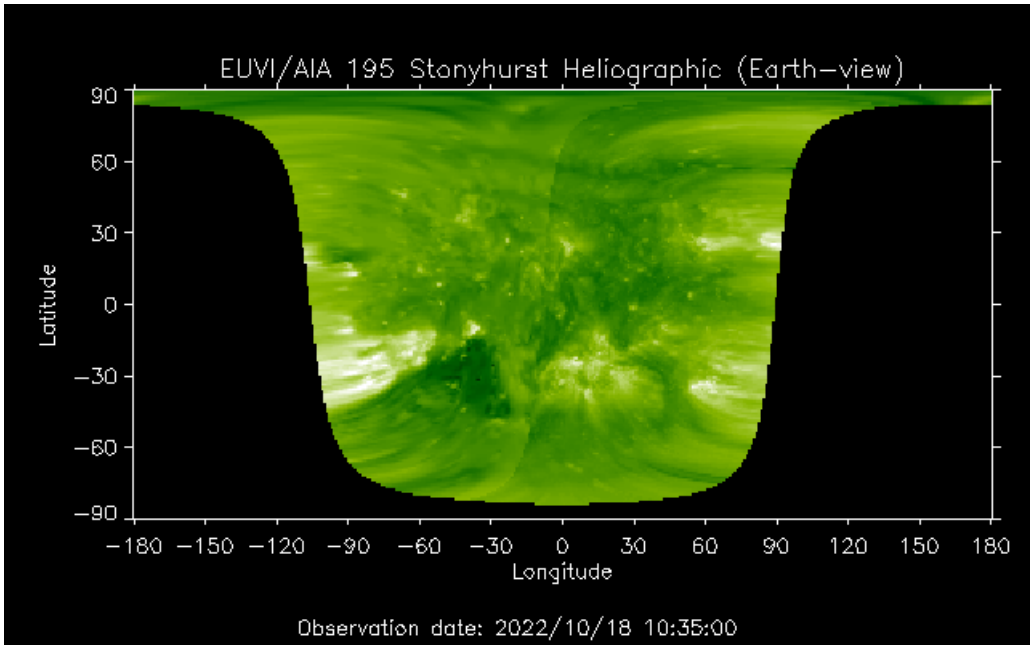
Radio Blackouts - X-Ray Flares:
Solar activity over the past 24 hours has been Low with a long period C3 flare from AR3124 (Dao/Beta). This is the largest and most complex group, although it remains a relatively small and magnetically straightforward region. There are currently four numbered sunspot regions on the visible disc, none of which are showing much size or complexity. AR3125 (Bxo/Beta) has decayed a little in recent hours. AR3119 has recently rotated off the disc with AR3123 due to leave later on Day 1 (18 Oct). Some new spots may be emerging in the southeast quadrant.

Far-side soundings and STEREO-A EUVI 195 imagery hint at a possible returning sunspot region over the southeastern solar horizon, perhaps ex-3107. It is difficult to tell at this stage whether this region is likely to still be active, however. Overall, the presence of AR3124 will maintain a very slight chance of M-flares into Day 3 (20 Oct) before reducing as this region rotates off the disc.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	2	2	1
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: STEREO-A EUVI 195 imagery hints at a possible returning sunspot region over the southeastern solar horizon, perhaps ex-3107.



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as observed by GOES16 is currently at background levels and is expected to remain at this level.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	2	2	2
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES16 peaked just short of High (1000 pfu) levels yesterday. A further increase in the coming days is possible as the current HSS from CH32 wanes. A new HSS from CH33 is expected to arrive later in the period, although this is likely to be weak and may not have much effect on electron levels.

Fluence levels are expected to rise through this period, perhaps close to the Active (1e8 integrated pfu) threshold. MOSWOC REFM is suggesting a rise just above the Active threshold and this seems to be a reasonable trend although confidence in the magnitude of the peak fluence level is low.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	20	40	50	50
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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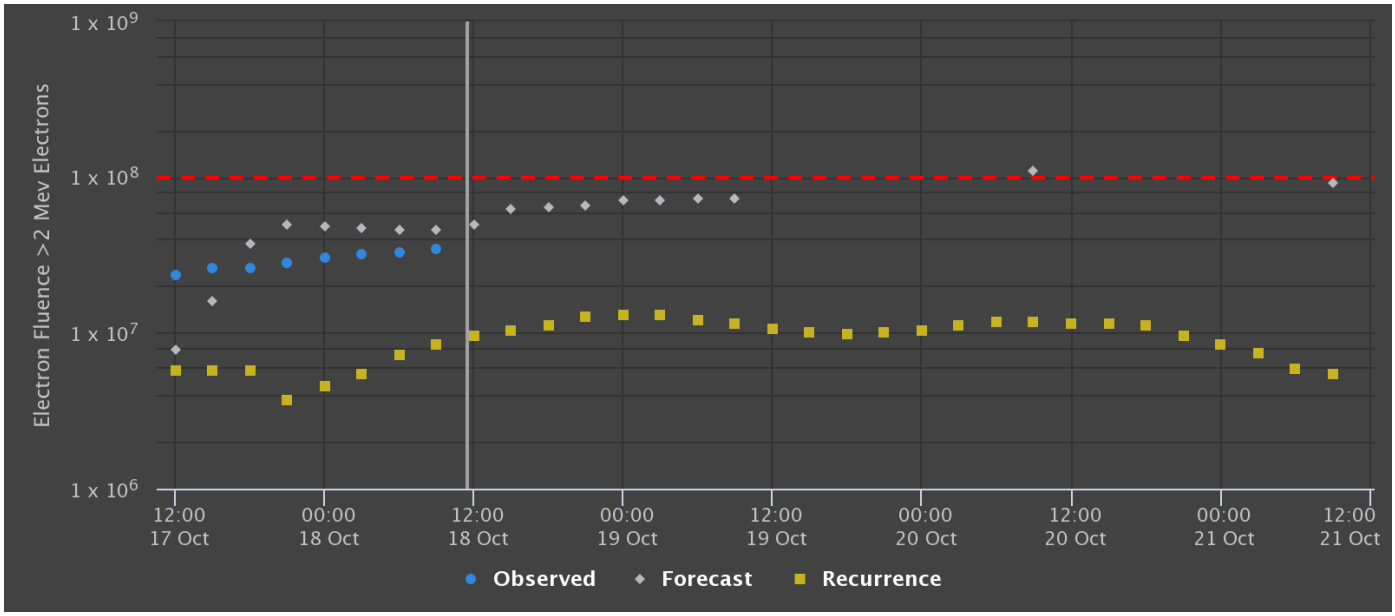
Figure 4: MOSWOC REFM shows a rise to just above Active by days 3 and 4, although peak fluence levels are low confidence.



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